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Eiki et al.

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(54) **FIXING DEVICE AND IMAGE FORMING APPARATUS**

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CPC ***G03G 15/2053*** (2013.01); ***G03G 15/161*** (2013.01); ***G03G 15/2017*** (2013.01); *G03G 2215/2003* (2013.01); *G03G 2215/207* (2013.01)

(58) **Field of Classification Search**
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See application file for complete search history.

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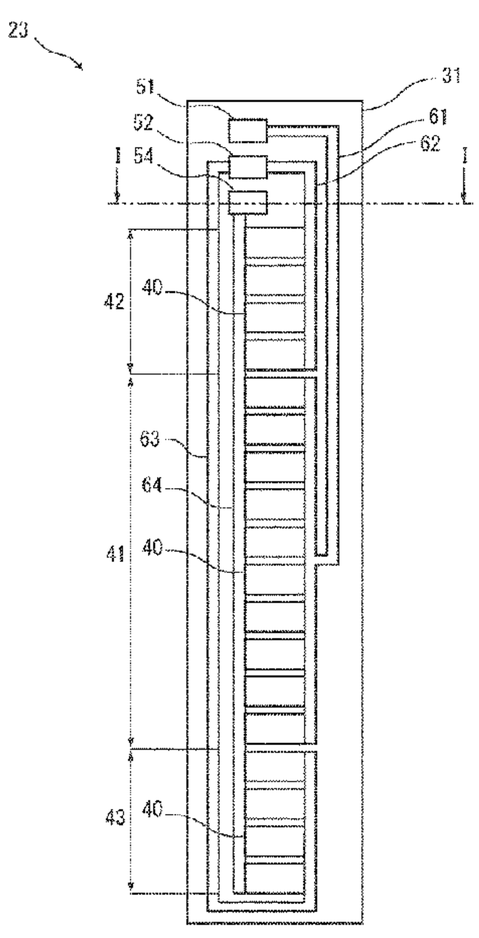
(57) **ABSTRACT**

A fixing device includes a cylindrical rotatable fixing belt, a flat heater, a heater holding part, a pressuring member, and a connector. In the flat heater, an electrode part, a feeder and a heat generating part are formed in the same face state. The heater holding part holds the flat heater so that the heat generating part faces to an inner circumference face of the fixing belt. The pressuring member sandwiches the fixing belt with the flat heater. The connector has a contacting portion coming into contact with the electrode part. The feeder has a portion arranged at a near side from the electrode part in an attaching direction of the connector. The heater holding part includes a protecting portion covering the portion of the feeder arranged at the near side from the electrode part.

16 Claims, 9 Drawing Sheets



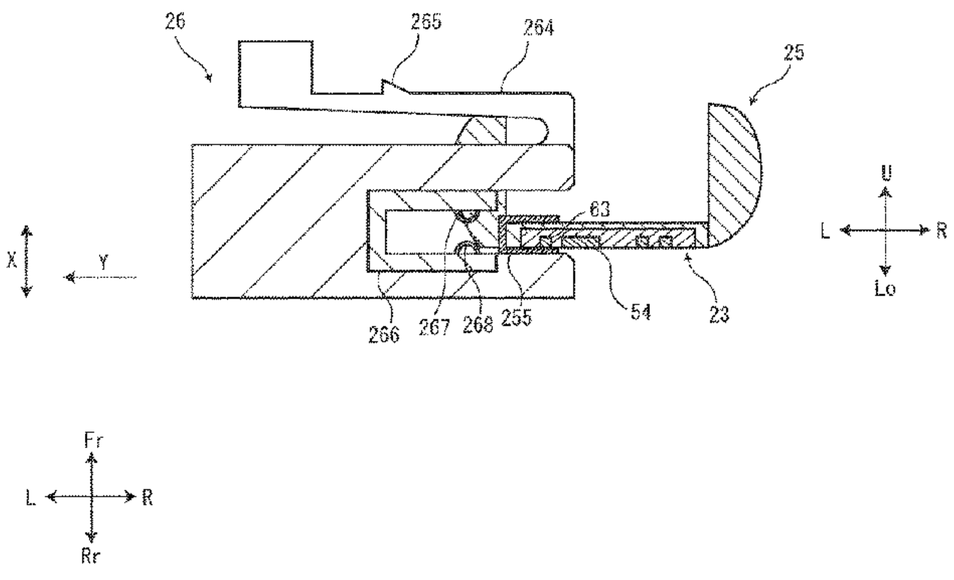


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FIG. 1

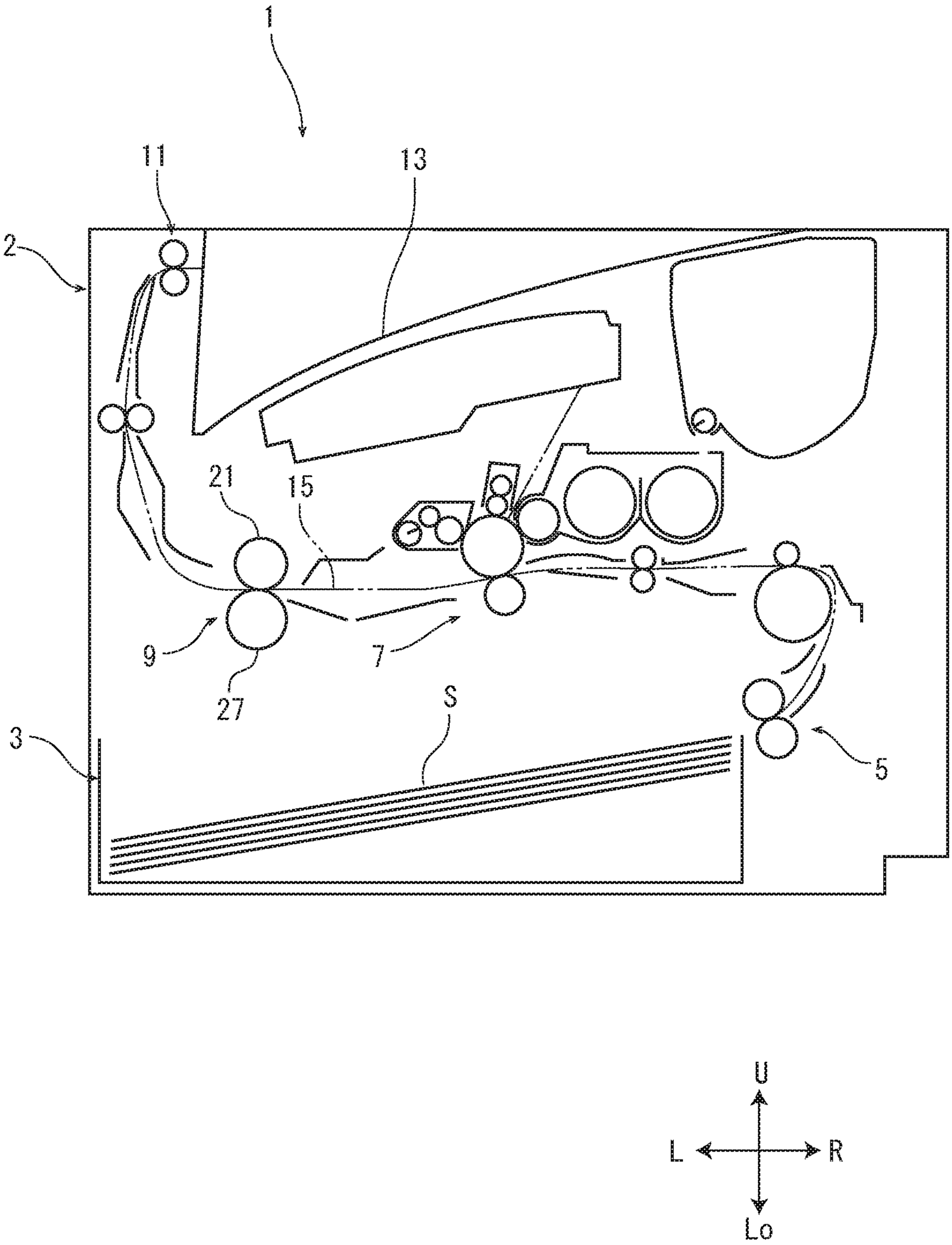


FIG. 2

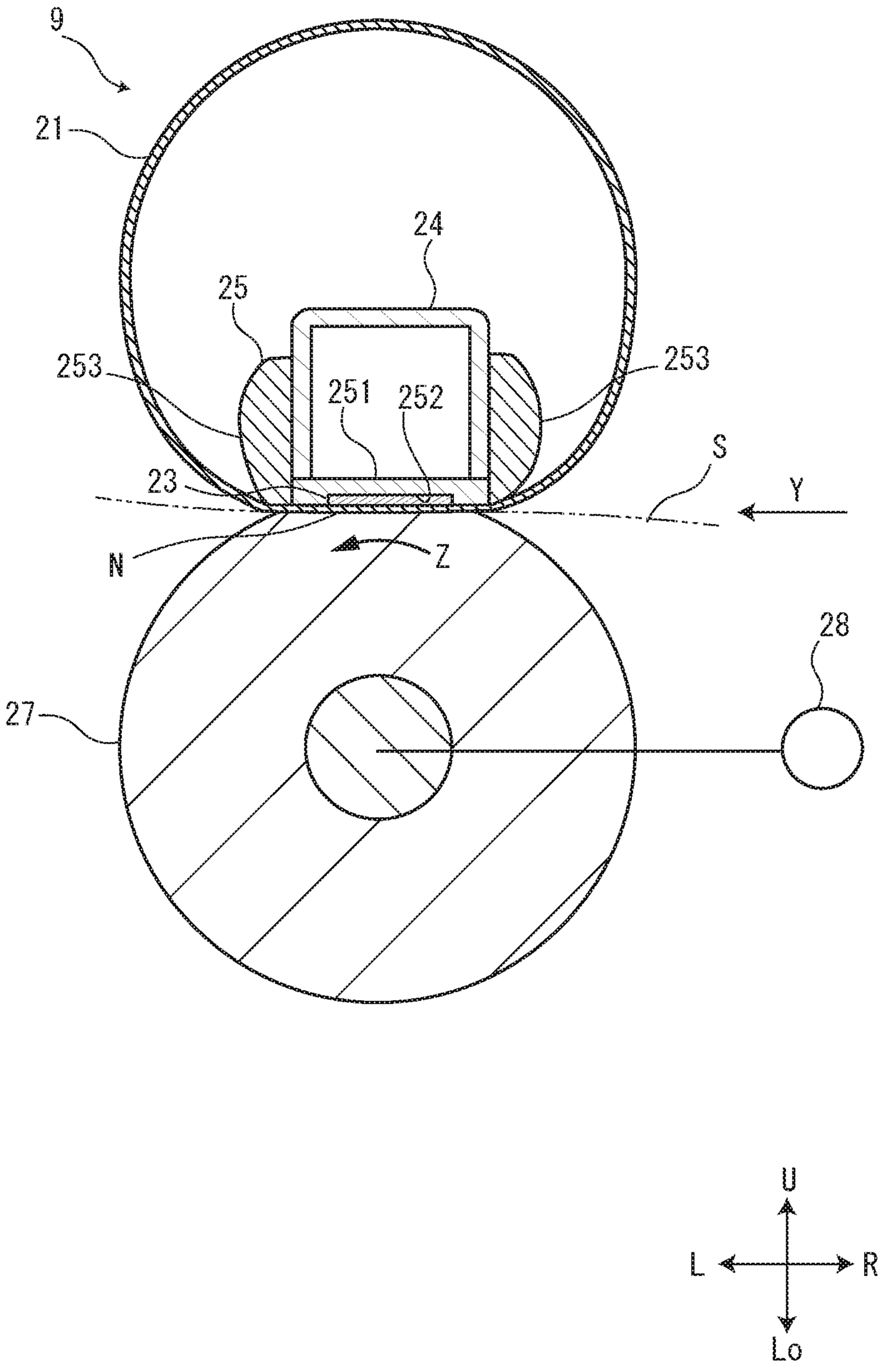
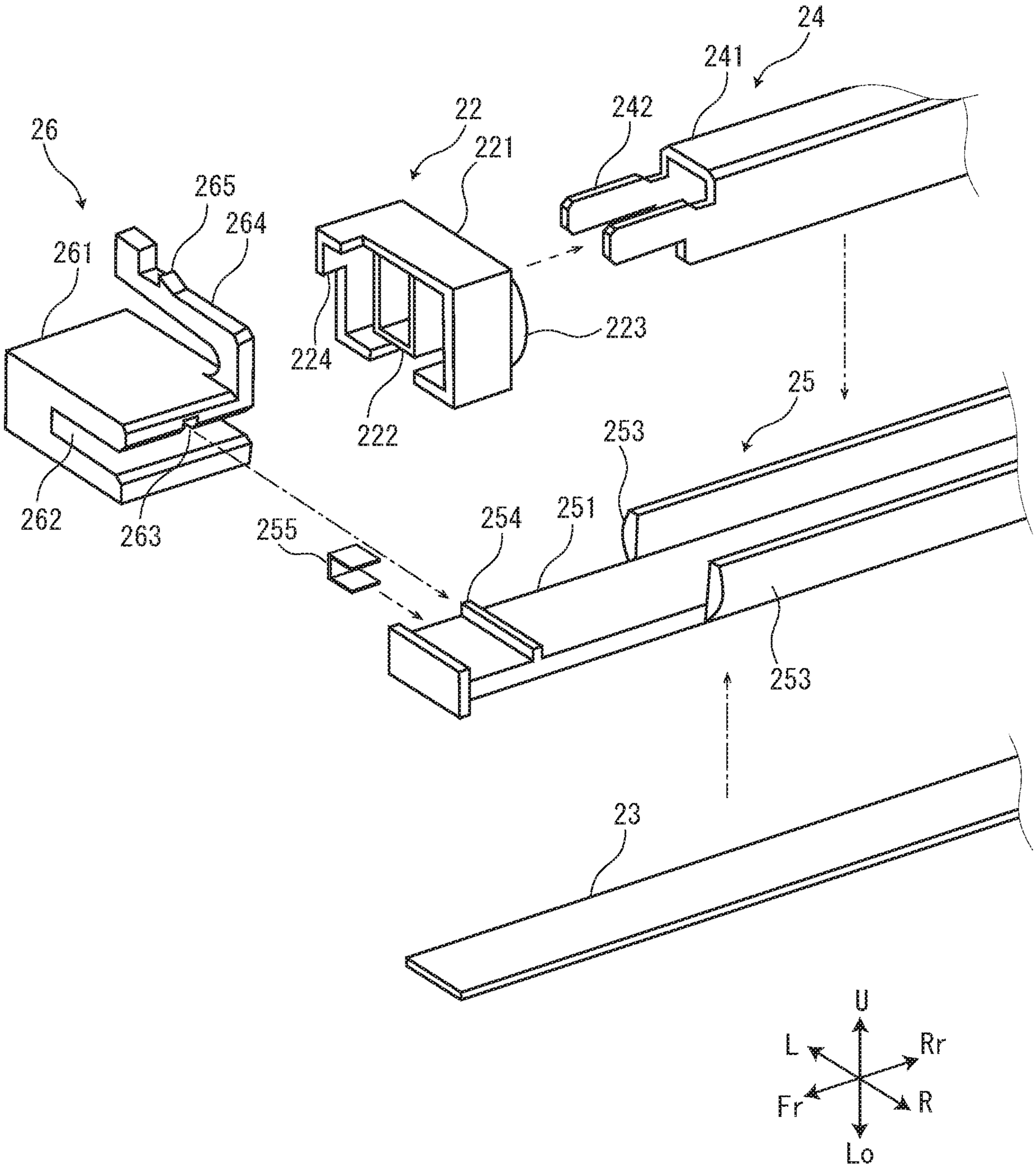


FIG. 3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241
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265
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223
224
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253
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251
255
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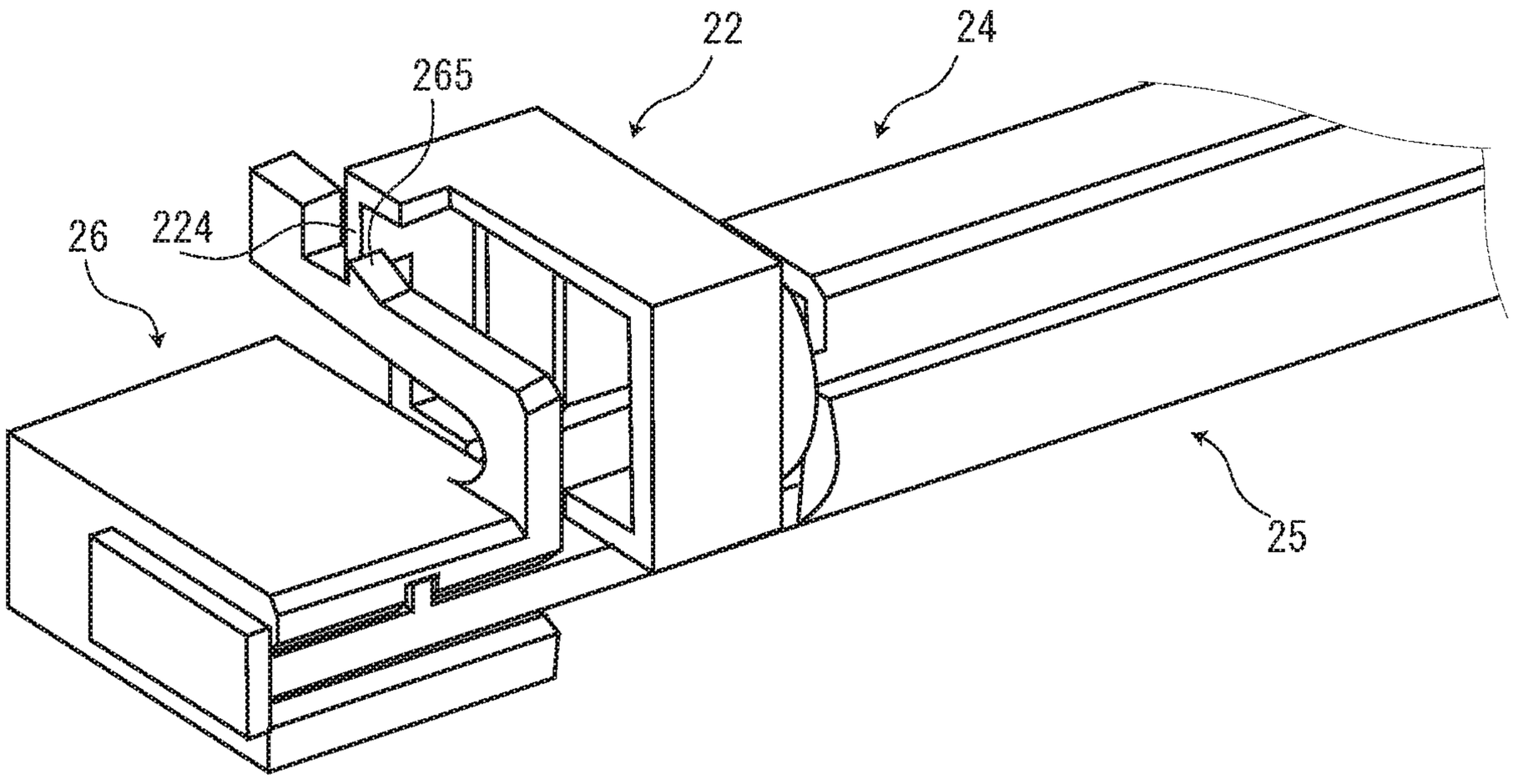
263
253
23
U
L
Rr
Fr
R
Lo

FIG. 4



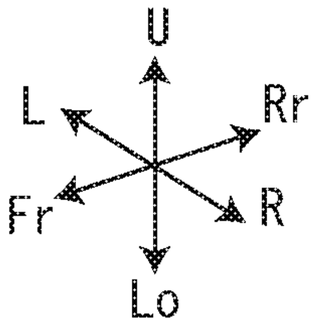


FIG. 5

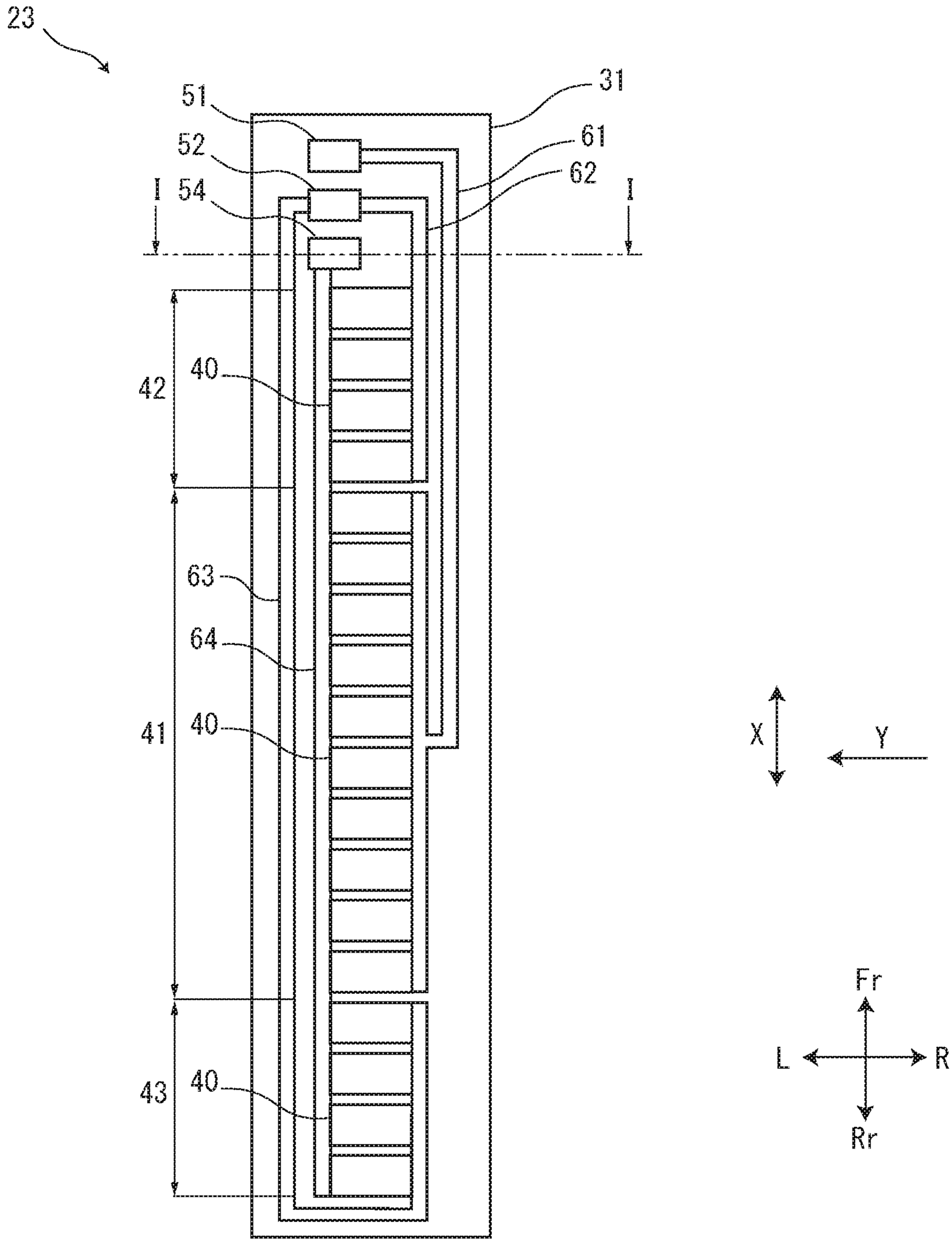
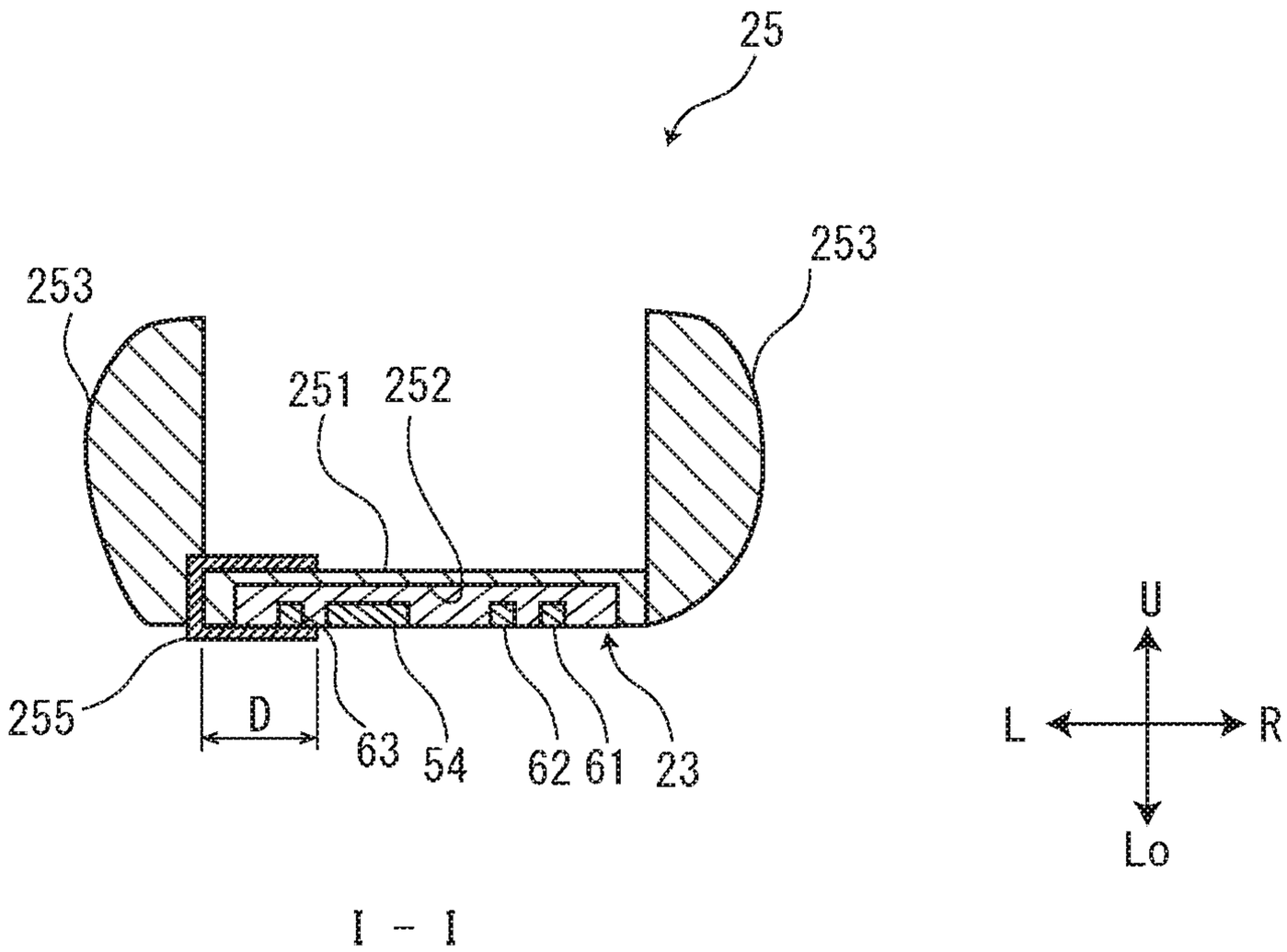


FIG. 6A


25
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251
252
255
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63
54
62
61
23
U
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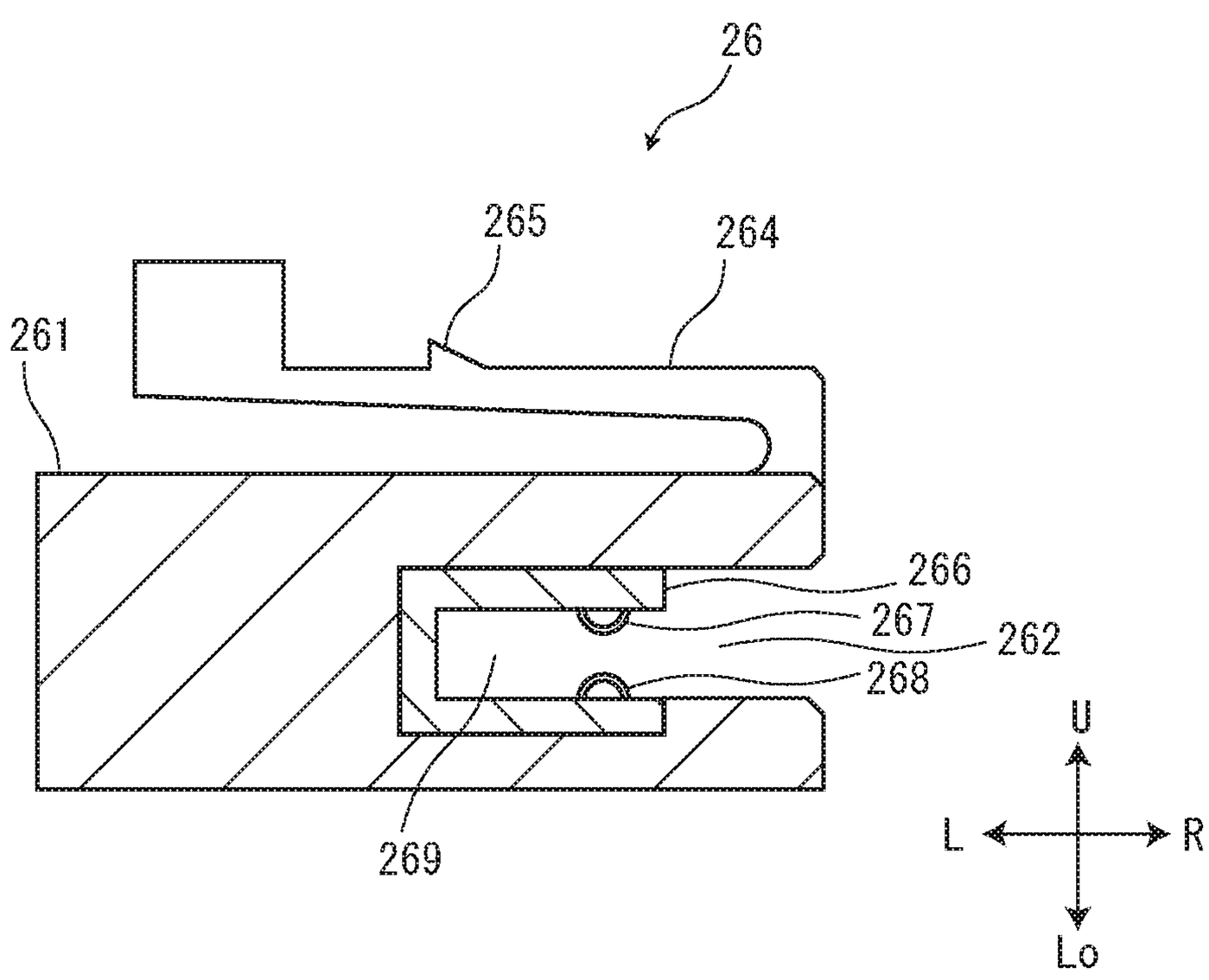
Lo
I – I

FIG. 6B


26
265
264
261
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267
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268
269
U
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FIG. 7A

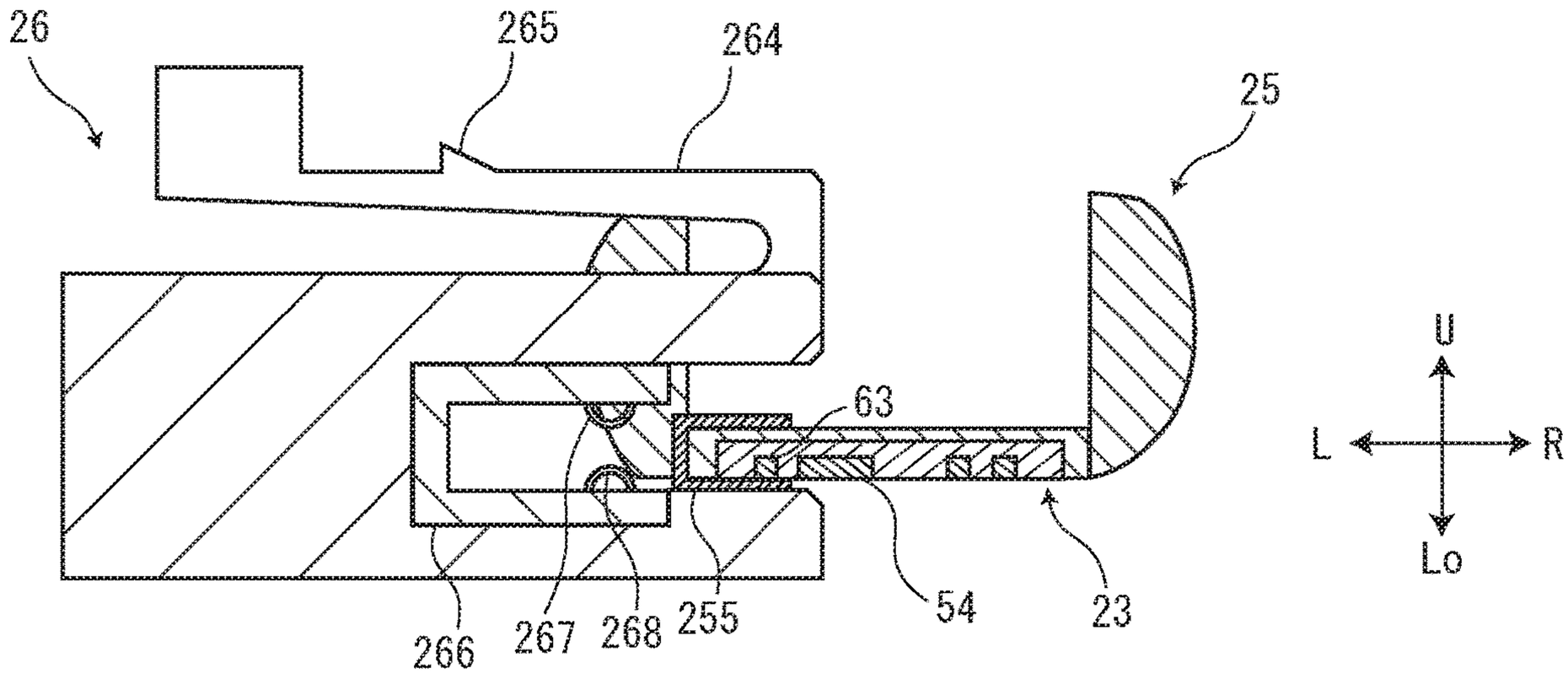


FIG. 7B

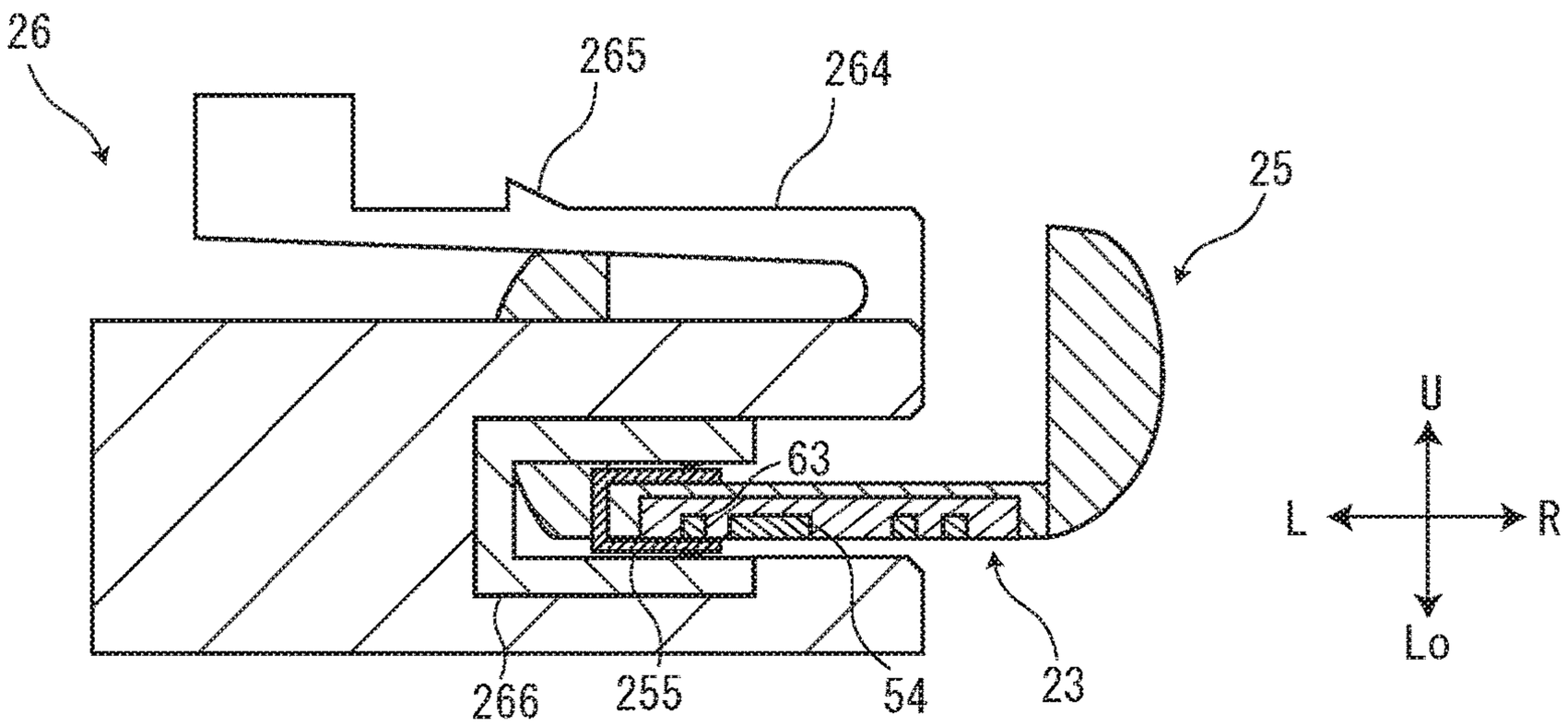


FIG. 7C

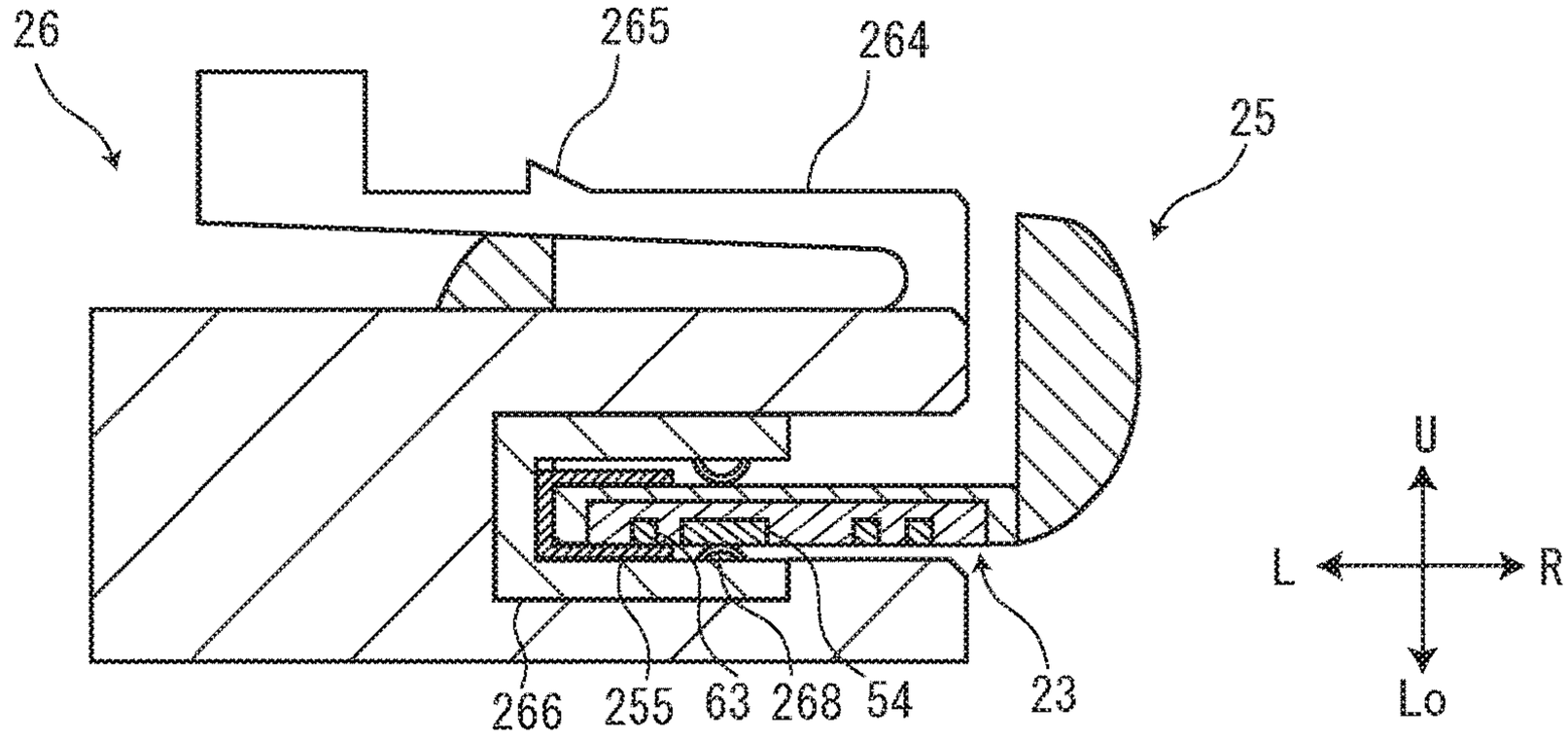
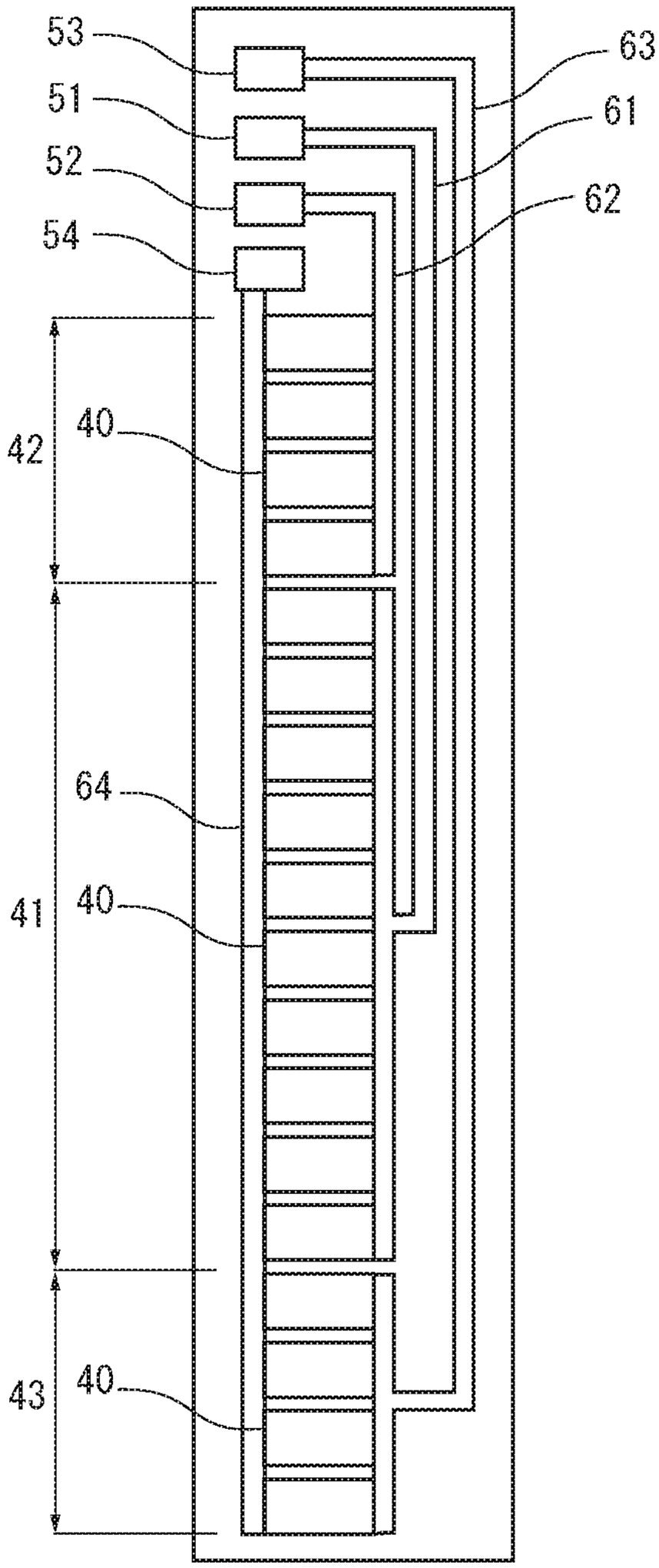
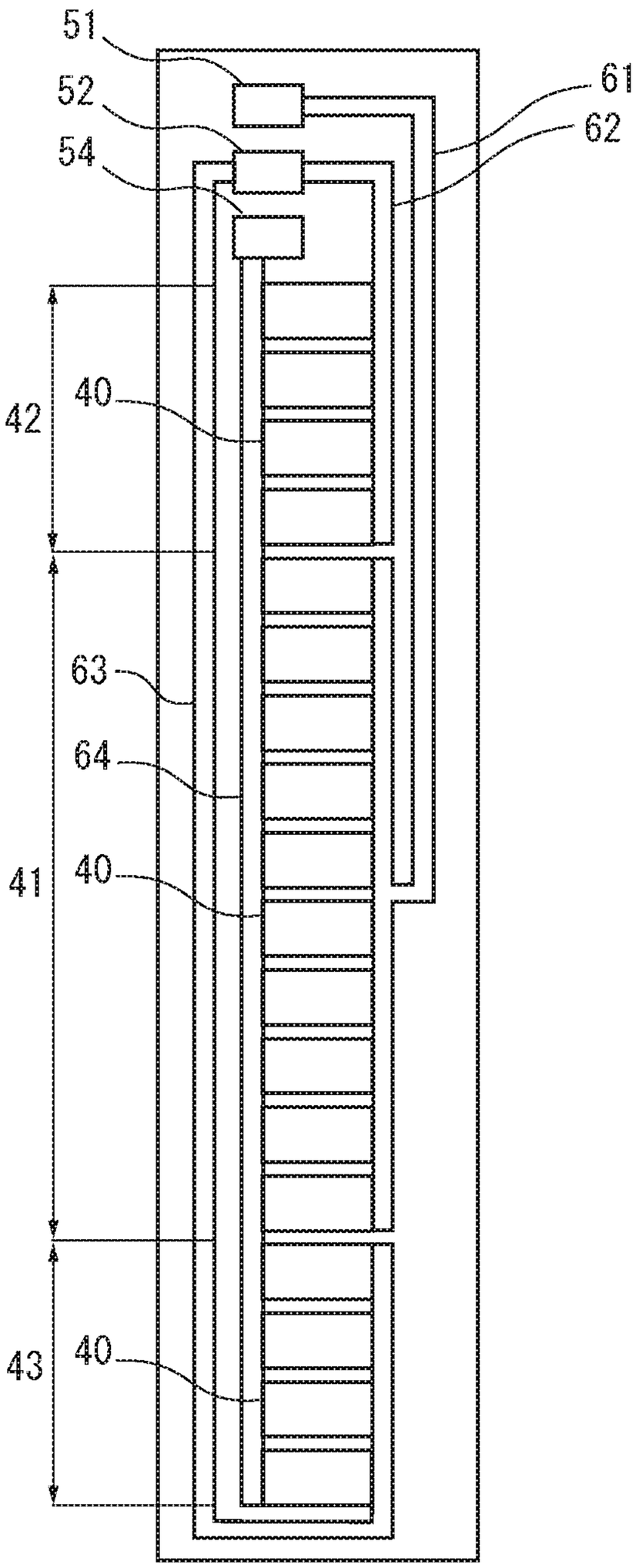


FIG. 8



RELATED ART

FIG. 9



RELATED ART

FIXING DEVICE AND IMAGE FORMING APPARATUS

INCORPORATION BY REFERENCE

This application is based on and claims the benefit of priority from Japanese Patent application No. 2018-132525 filed on Jul. 12, 2018, the entire contents of which are incorporated herein by reference.

BACKGROUND

The present disclosure relates to a fixing device fixing a toner image on a sheet and an image forming apparatus including this fixing device.

As one manner heating a fixing belt of a fixing device, a manner using a flat heater is known. The flat heater has a heat generating part having a longitudinal direction orthogonal to a conveying direction of a sheet, and is arranged so that the heat generating part faces to an inner circumference face of the fixing belt. The fixing belt is sandwiched between the flat heater and a pressuring roller.

A length in the longitudinal direction of the heat generating part is a length corresponding to the sheet of a maximum size and, if the sheet of a size smaller than it is used, heat consumption of both ends in the longitudinal direction through which the sheet does not pass is decreased. Thereupon, as shown in FIG. **8**, a configuration is proposed, in which a plurality of heat generating parts **41** to **43** are arranged in the longitudinal direction and the heat generating part according to the size of the sheet is heated.

Concretely, the heat generating parts **41** to **43** have a plurality of resistance heat generating elements **40** arranged along one line parallel to the longitudinal direction. The heat generating part **41** is located at a center portion in the longitudinal direction and the heat generating parts **42** and **43** are located at both adjacent sides to it. At a side of the heat generating part **42**, electrode parts **51** to **54** are arranged along one line parallel to the longitudinal direction. Feeders **61**, **62** and **63** are respectively connected to right ends of the heat generating parts **41**, **42** and **43** on a paper sheet of the figure. A feeder **64** is connected to left ends of the heat generating parts **41** to **43** on a paper sheet of the figure. The feeders **61**, **62**, **63** and **64** are respectively connected to the electrode parts **51**, **52**, **53** and **54**. Further, a connector is attached at a position shifted to a right side from a left side of the electrode parts **51** to **54**.

By contrast, as shown in FIG. **9**, another configuration is proposed, in which the feeders **62** and **63** are connected to the electrode part **52** and the electrode part **53** is omitted so that a length in the longitudinal direction of the flat heater is shortened. However, in such a case, because the feeder **63** is arranged at a near side from the electrode parts **52** and **54** in an attaching direction of the connector, it is feared that the feeder **63** is scraped off by friction with a contacting portion of the connector when the connector is attached and conduction failure occurs.

Thereupon, conventionally, a technique of restraining conduction failure due to contact of the contacting portion and the flat heater when the connector is attached is researched. For example, a conventional connector includes a housing having an opening, and a contact terminal having a supporting face portion, a contacting portion and an engaging face portion and being electrically connected to an electrode part inserted in the opening by protruding operation to the opening. A restricting member pushes the contact terminal to retract the contacting portion from the opening,

and thereby, restrict the contacting portion from coming into contact with a member inserted inside the opening, and separates the contact terminal to protrude the contacting portion to the opening.

However, the above-mentioned conventional configuration, a shape of the connector is complicated. Moreover, a size of the connector is enlarged.

SUMMARY

In accordance with the present disclosure, a fixing device includes a cylindrical rotatable fixing belt, a flat heater, a heater holding part, a pressuring member, and a connector. In the flat heater, an electrode part, a feeder and a heat generating part are formed in the same face state. The heater holding part holds the flat heater so that the heat generating part faces to an inner circumference face of the fixing belt. The pressuring member sandwiches the fixing belt with the flat heater. The connector has a contacting portion coming into contact with the electrode part. The feeder has a portion arranged at a near side from the electrode part in an attaching direction of the connector. The heater holding part includes a protecting portion covering the portion of the feeder arranged at the near side from the electrode part.

In accordance with the present disclosure, an image forming apparatus includes an image forming part forming a toner image on the sheet, and the fixing device as described above to fix the toner image on the sheet.

The above and other objects, features, and advantages of the present disclosure will become more apparent from the following description when taken in conjunction with the accompanying drawings in which a preferred embodiment of the present disclosure is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view schematically showing an internal structure of a printer according to an embodiment of the present disclosure.

FIG. **2** is a sectional view showing a fixing device according to the embodiment of the present disclosure.

FIG. **3** is an exploded perspective view showing a heater holding member and the periphery in the fixing device according to the embodiment of the present disclosure.

FIG. **4** is a perspective view showing the heater holding member and the periphery in the fixing device according to the embodiment of the present disclosure.

FIG. **5** is a lower face view showing a flat heater in the fixing device according to the embodiment of the present disclosure.

FIG. **6**A is a sectional view showing the heater holding member and the flat heater along an I-I line in FIG. **5**.

FIG. **6**B is a sectional view showing a connector in the fixing device according to the embodiment of the present disclosure.

FIG. **7**A is a sectional view showing the flat heater and the connector in the fixing device according to the embodiment of the present disclosure.

FIG. **7**B is a sectional view showing the flat heater and the connector in the fixing device according to the embodiment of the present disclosure.

FIG. **7**C is a sectional view showing the flat heater and the connector in the fixing device according to the embodiment of the present disclosure.

FIG. **8** is a lower face view showing a flat heater of a related art.

FIG. **9** is a lower face view showing a flat heater of a related art.

DETAILED DESCRIPTION

Hereinafter, with reference to the accompanying drawings, embodiments of an image forming apparatus and a fixing device of the present disclosure will be described.

First, the entire structure of a printer **1** as the image forming apparatus will be described with reference to FIG. **1**. FIG. **1** is a sectional view schematically showing an internal structure of the printer **1**. Hereinafter, it will be described so that the front side of the color printer **1** is positioned at a near side on a paper sheet of FIG. **1** and that left and right directions is defined as seen from the front side of the color printer **1**. Arrows U, Lo, L, R, Fr and Rr in each of the drawings respectively indicate an upper side, a lower side, a left side, a right side, a front side and a rear side of the printer **1**.

In an apparatus body **2** of the printer **1**, a sheet feeding cartridge **3** storing sheets S, a sheet feeding device **5** feeding the sheet S from the sheet feeding cartridge **3**, an image forming part **7** forming a toner image on the sheet S, a fixing device **9** fixing the toner image on the sheet S, a sheet ejecting device **11** ejecting the sheet S, and an ejected sheet tray **13** receiving the ejected sheet S are provided. Further, in the apparatus body **2**, a conveying path **15** of the sheet S is arranged so as to run from the sheet feeding device **5** to the sheet ejecting device **11** through the image forming part **7** and the fixing device **9**.

The sheet S fed from the sheet feeding cartridge **3** by the sheet feeding device **5** is conveyed to the image forming part **7** along the conveying path **15** and the toner image is formed on the sheet S. The sheet S is conveyed to the image fixing device **9** along the conveying path **15** and the toner image is fixed on the sheet S. The sheet S having the fixed toner is ejected from the sheet ejecting device **11** to the ejected sheet tray **13**.

Next, the fixing device **9** will be described with reference to FIG. **2**. FIG. **2** is a sectional view showing the fixing device **9**. FIG. **3** is an exploded perspective view showing a heater holding member **25** and the periphery. FIG. **4** is a perspective view showing the heater holding member **25** and the periphery. FIG. **5** is a lower face view showing a flat heater **23**. FIG. **6**A is a sectional view showing the heater holding member **25** and the flat heater **23** along an I-I line in FIG. **5**. FIG. **6**B is a sectional view showing a connector **26**.

The fixing device **9** includes a cylindrical shaped rotatable fixing belt **21**, the flat heater **23**, the heater holding member **25**, a pressuring roller **27**, and the connector **26**. In the flat heater **23**, electrode parts **51**, **52** and **54**, feeders **61** to **64**, and heat generating parts **41** to **43** are formed in the same face state. The heater holding member **25** holds the flat heater **23** so that the heat generating parts **41** to **43** face to an inner circumference face of the fixing belt **21**. The pressuring roller **27** sandwiches the fixing belt **21** with the flat heater **23**. The connector **26** has contacting portions **267** and **268** coming into contact with the electrode parts **51**, **52** and **54**. The feeder **63** has a portion being arranged at a near side from the electrode parts **52** and **54** in an attaching direction of the connector **26**, and the heater holding member **25** includes a protecting portion **255** covering the portion of the feeder **63** arranged at the near side from the electrode parts **52** and **54**. In the following description, an "axial direction X" indicates an axial direction of the pressuring roller **27** (forward and backward directions). Although, in the present embodiment, an example of the fixing device **9** arranged in a posture that the pressuring roller **27** is located below the fixing belt **21**, the fixing device **9** may be arranged in any of various postures.

As shown in FIG. **2**, the fixing belt **21** is a cylindrical belt having a longitudinal direction along the axial direction X and having flexibility, and has a predetermined inner diameter, and its length in the longitudinal direction is longer than a width of the sheet S. The fixing belt **21** has a base material layer, an elastic layer provided around an outer circumference face of the base material layer, and a release layer provided around an outer circumference face of the elastic layer. The base material layer is made of metal, such as stainless steel or nickel alloy. The elastic layer is made of silicone rubber or the like. The release layer is made of PFA tube or the like. On an inner circumference face of the base material layer, a sliding layer may be formed. The sliding layer is made of polyamide-imido, PTFE or the like.

As shown in FIGS. **5** and **6**A, the flat heater **23** is formed in a roughly rectangular plate shape having a longitudinal direction along the axial direction X. The flat heater **23** has a base material, a heat insulation layer **31**, and a coat layer. The base material and the coat layer are omitted in the figures.

The base material is made of material, such as ceramic, with electrical insulation property, and is formed in a roughly rectangular plate shape having a longitudinal direction along the axial direction X. The heat insulation layer **31** is made of material, such as ceramic or glass, with electrical insulation property and low heat conductivity, and is laminated on a lower face of the base material. The heat insulation layer **31** restrains conducting of heat generated by the heat generating parts **41** to **43** to a side of the base material.

The heat generating parts **41** to **43** are made of material, such as metal, with electrical conductivity having a resistance value higher than the feeders **61** to **64**, and are formed on a lower face of the heat insulation layer **31**. The heat generating parts **41** to **43** are arranged along one line parallel to the axial direction X. Each of the heat generating parts **41** to **43** has a plurality of resistance heat generating elements **40** arranged along one line parallel to the axial direction X.

The heat generating part **41** is arranged within a range corresponding to a length of a longer side of the sheet S of a small size (e.g. JIS A5 size). The heat generating parts **42** and **43** are arranged within a range corresponding to a length of a longer side of the sheet S of a large size (e.g. JIS A4 size) where the heat generating part **41** is not arranged. The heat generating parts **42** and **43** are respectively located at a front side and a rear side of the heat generating part **41**.

The feeders **61** to **64** are made of material, such as metal, with electrical conductivity having a resistance value lower than the resistance heat generating element **40**, and are formed on the lower face of the heat insulation layer **31**. The feeder **61** is connected to right ends (ends at an upstream side in a conveying direction Y of the sheet S) of the plurality of resistance heat generating elements **40** included in the heat generating part **41**. The feeder **62** is connected to right ends of the plurality of resistance heat generating elements **40** included in the heat generating part **42**. The feeder **63** is connected to right ends of the plurality of resistance heat generating elements **40** included in the heat generating part **43**. On the other hand, the feeder **64** is connected to left ends (ends at a downstream side in the conveying direction Y) of the plurality of resistance heat generating elements **40** included in the heat generating parts **41** to **43**. The electrode parts **51**, **52** and **54** are located at a

front side portion from the heat generating part **42** on the lower face of the heat insulation layer **31** in order of the electrode parts **51**, **52**, **54** from the front side.

The feeder **61** is connected to the electrode part **51**, the feeders **62** and **63** are connected to the electrode part **52**, and the feeder **64** is connected to the electrode part **54**. However, although the feeders **61** and **62** are arranged at right side portions (at the upstream side in the conveying direction Y) from the heat generating parts **41** and **42**, the feeder **63** is arranged from a right end of the heat generating part **43** through a rear side portion from the heat generating part **43** and left side portions (at the downstream side in the conveying direction Y) from the heat generating parts **43**, **42** and **41** and the electrode parts **54** and **52**, and is connected to the electrode part **52**. Incidentally, on the lower face of the heat insulation layer **31**, in portions in which the heat generating parts **41** to **43**, the feeders **61** to **64** and the electrode parts **51** to **54** are not formed, the heat insulation layer **31** is laminated so as to form a flat face together with the heat generating parts **41** to **43**, the feeders **61** to **64** and the electrode parts **51** to **54**.

The coat layer covers a range in the longitudinal direction of the heat insulation layer **31** where the heat generating parts **41** to **43** are formed. The coat layer is made of, for example, material, such as ceramic, with electrical insulation property and small sliding friction force with respect to the fixing belt **21**. A lower face of the coat layer comes into contact with the inner circumference face of the fixing belt **21**.

As shown in FIGS. **2**, **3** and **6**A, the heater holding member **25** has a body portion **251** having a longitudinal direction along the axial direction X. A length in the longitudinal direction of the body portion **251** is longer than the length in the longitudinal direction of fixing belt **21**. In a lower portion of the body portion **251**, a recessed portion **252** having a longitudinal direction along the axial direction X is formed. The flat heater **23** is fitted into the recessed portion **252** in a posture that the heat generating parts **41** to **43** is located at a lower side. At left and right sides of the heater holding member **25**, curved portions **253** with curvature slightly larger than curvature of the fixing belt **21** are formed, and the curved portions **253** and the flat heater **23** compose a smooth face coming into contact with the inner circumference face of the fixing belt **21**. In an upper face of a front side end of the body portion **251**, a protruded portion **254** extended in the left and right directions is formed. The heater holding member **25** is made of, for example, heat resistant resin, such as liquid crystal polymer.

As shown in FIGS. **3** and **6**A, the heater holding member **25** includes the protecting portion **255**. The protecting portion **255** has a recess penetrating in the forward and backward directions, and a height in upward and downward directions of the recess is roughly equal to a thickness of the heater holding member **25**. A depth D in the left and right directions of the recess of the protecting portion **255** is equal to or more than a distance from a left end of the heater holding member **25** to a right end of the feeder **63** and equal to or less than a distance from a left end of the heater holding member **25** to a left end of the electrode part **54**. That is, the recess of the protecting portion **255** has the depth covering a range from the left end of the heater holding member **25** to at least the feeder **63**. The protecting portion **255** is made of, for example, material, such as a graphite sheet, with insulation property and high heat conductivity. Here, the high heat conductivity means heat conductivity higher than materials of the base material, the heat insulation layer **31** and the coat layer of the flat heater **23**. For instance, in a case the base material, the heat insulation layer **31** and the coat layer of the flat heater **23** are made of ceramic (alumina), heat conductivity is equal to or more than 35 W/mK as a standard. The protecting portion **255** is stuck to the heater holding member **25** with, for example, a silicone adhesive or a heat resistant tape.

As shown in FIG. **2**, the pressuring roller **27** has a core metal, an elastic layer provided around an outer circumference face of the core metal, and a release layer provided around an outer circumference face of the elastic layer. The elastic layer is made of silicon rubber or the like. The release layer is made of PFA tube or the like. The pressuring roller **27** sandwiches the fixing belt **21** with the flat heater **23** to form the pressuring area N between the fixing belt **21** and the pressuring roller **27**. The pressuring roller **27** is driven by a motor **28** to make the fixing belt **21** co-rotate with the pressuring roller **27**, and sandwiches and conveys the sheet S.

As shown in FIGS. **2** and **3**, a pressing member **24** has a body portion **241** having a longitudinal direction along the axial direction X, and a pair of protruded portions **242** formed at both front and rear ends in the longitudinal direction of the body portion **241** and protruded in the longitudinal direction, and is arranged so as to penetrate a hollow portion of the fixing belt **21**. The pressing member **24** is made of metal, such as stainless steel or aluminum alloy. The fixing belt **21** is supported by an arc-shaped belt guide (not shown) supported by the pressing member **24**, and is rotatable along the belt guide.

As shown in FIG. **3**, a belt holding member **22** is a roughly box-shaped member, and is located at both front and rear ends in the longitudinal direction of the pressing member **24**. At the center of a body portion **221** of the belt holding member **22**, a core portion **222** having a width corresponding to a distance between the pair of protruded portions **242** of the pressing member **24** is formed. In the body portion **221**, at a side of the fixing belt **21**, an arc portion **223** corresponding to the inner circumference face of the fixing belt **21** is formed, and the arc portion **223** is fitted into an end in the longitudinal direction of the fixing belt **21**. At a front side of a left wall of the body portion **221**, a protruded portion **224** is formed by cutting out its lower portion. The belt holding member **22** is fixed to a housing (not shown) of the fixing device **9**. The belt holding member **22** is made of, for example, heat resistant resin, such as liquid crystal polymer.

As shown in FIGS. **3** and **6**B, the connector **26** has a rectangular parallelepiped body portion **261** and, in a right side face of the body portion **261**, a recessed portion **262** penetrating in the forward and backward directions is formed. In an upper side face of the recessed portion **262**, a recessed portion **263** having a shape corresponding to the protruded portion **254** of the heater holding member **25** is formed. A lever **264** is formed so as to protrude from a right end of an upper portion of the body portion **261** to the upper side and to extend from an upper portion of its protruded portion to the left side, and has flexibility. In an upper portion of a portion extended to the left side in the lever **264**, a projected portion **265** is formed. In the projected portion **265**, an inclined portion having a downward gradient from the left side to the right side is formed. The body portion **261** and the lever **264** are made of, for example, heat resistant resin, such as liquid crystal polymer.

In the recessed portion **262**, a terminal portion **266** is provided. The terminal portion **266** is a groove-shaped terminal having a recessed portion **269** penetrating in the forward and backward directions, and a thickness in the

upward and downward directions of the recessed portion **269** is larger than a thickness of the body portion **251** of the heater holding member **25**. In an inner face at an upper side of the recessed portion **269**, a contacting portion **267** protruded to the lower side is provided and, in an inner face at a lower side of the recessed portion **269**, a contacting portion **268** protruded to the upper side is provided. The contacting portions **267** and **268** are plate spring-shaped contacts having flexibility, and can be respectively pushed to the upper side and the lower side.

Next, with reference to FIGS. **3**, **6**A, **7**A to **7**C, procedure combining the above-described components will be described. FIGS. **7**A to **7**C are sectional views showing conditions that the connector **26** is attached to the heater holding member **25**.

Firstly, as shown in FIGS. **3** and **6**A, into the recessed portion **252** of the heater holding member **25**, the flat heater **23** is fitted and, to the heater holding member **25** into which the flat heater **23** is fitted, the protecting portion **255** is attached.

Subsequently, as shown in FIG. **4**, on an upper portion of the heater holding member **25**, the pressing member **24** is located and, between the pair of protruded portions **242** of the pressing member **24**, the core portion **222** of the belt holding member **22** is sandwiched.

And then, as shown in FIG. **3**, to the protruded portion **254** of the heater holding member **25**, the recessed portion **263** of the connector **26** is matched and, as shown in FIG. **7**A, the connector **26** is moved from the left side to the right side with respect to the heater holding member **25**.

When the connector **26** is further pushed, as shown in FIG. **7**B, the contacting portions **267** and **268** are respectively pushed to the upper side and the lower side by the protecting portion **255**. Although the feeder **63** has the portion arranged at the near side from the electrode parts **52** and **54** in the attaching direction of the connector **26**, since the portion is covered by the protecting portion **255**, it is not feared that the portion is scraped off by friction with the contacting portion **268**. At this time, the inclined portion of the projected portion **265** of the lever **264** comes into contact with the protruded portion **224** of the belt holding member **22**, and the lever **264** is warped to the lower side.

When the connector **26** is furthermore pushed, as shown in FIG. **7**C, the protecting portion **255** passes over the contacting portions **267** and **268** and a left end of the protecting portion **255** reaches a deepest portion of the recessed portion **269** of the terminal portion **266**. At this time, the contacting portions **267** and **268** are changed from pushed states to respective states protruded to the lower side and the upper side, and the contacting portion **268** comes into contact with the electrode parts **51**, **52** and **54**. At this time, the projected portion **265** of the lever **264** passes over the protruded portion **224** of the belt holding member **22** and moves to the right side of the protruded portion **224**, and then, warp of the lever **264** is released. Movement of the projected portion **265** to the left side is restricted by the protruded portion **224**, and then, the connector **26** is fixed. Incidentally, in order to detach the connector **26** from the heater holding member **25**, by pushing the lever **264** to the lower side, the connector **26** may be moved to the left side.

A fixing operation of the fixing device **9** having the above-described configuration will be described. When the pressuring roller **27** is driven and rotated in a predetermined rotating direction Z, the fixing belt **21** is co-rotated with the pressuring roller **27** in an opposite rotating direction to the rotating direction Z of the pressuring roller **27**, and the inner circumference face of the fixing belt **21** is slide with respect to the flat heater **23**. When power is supply to the heat generating parts **41** to **43** of the flat heater **23**, the heat generating parts **41** to **43** generate heat to heat the fixing belt **21**. After temperature of the fixing belt **21** reaches predetermined temperature, the sheet S on which the toner is transferred is conveyed to the pressuring area N. In the pressuring area N, the sheet S is sandwiched between the fixing belt **21** and the pressuring roller **27** and conveyed. At this time, the toner is heated and pressured by the fixing belt **21**, and them, the toner is fixed on the sheet S. The sheet S on which the toner is fixed is separated from the fixing belt **21** and conveyed along the conveying path **15**.

As described above, in accordance with the present embodiment, the feeder **63** arranged at the near side from the electrode parts **52** and **54** in the attaching direction of the connector **26** is covered by the protecting portion **255**. Therefore, according to the embodiment, without using a connector having a complicated shape, it is possible to protect the feeder **63** arranged at the near side from the electrode parts **52** and **54** in the attaching direction of the connector **26**. Moreover, according to the embodiment, since the protecting portion **255** is made of material having high heat conductivity, it is possible to restrain temperature rise of the portion covered by the protecting portion **255**.

Although, in the present embodiment, an example attaching the protecting portion **255** formed in a shape shown in FIG. **6**A to the heater holding member **25**, the present disclosure is not limited by the protecting portion **255** formed in such a shape. For instance, in a modified example, a bendable protecting portion **255** formed in a sheet-shape may be stuck to the heater holding member **25**.

Although, in the present embodiment, an example providing the protecting portion **255** and the heater holding member **25** as different members is described, in a modified example, the protecting portion **255** may be integrally formed with the heater holding member **25**. For instance, after the feeder **63** is formed on the heat insulation layer **31**, on its lower face, material having insulation property and high heat conductivity may be laminated, and thereby, the protecting portion **255** may be formed. In such a case, the protecting portion **255** only needs to have an area covering at least the feeder **63**.

Although, in the present embodiment, an example that the flat heater **23** has three heat generating parts **41** to **43** is described, in a modified example, regardless of the number of the heat generating parts of the flat heater **23**, the present disclosure may be applied in a case where the feeder has the portion arranged at the near side from the electrode parts in the attaching direction of the connector.

Although, in the present embodiment, a case where the present disclosure is applied to the printer **1** has been described as one example, the disclosure is not restricted by this, but may be applied to a copying machine, a facsimile, a multifunction peripheral or the like.

The above-description of the embodiment of the present disclosure was described about a preferable embodiment of the fixing device and the image forming apparatus according to the disclosure. However, the technical scope of the present disclosure is not limited to the embodiments.

The invention claimed is:

1. A fixing device comprising:

a cylindrical rotatable fixing belt being long in an axial direction;

a flat heater in which an electrode part, a feeder and a heat generating part are formed in the same face state;

a heater holding part holding the flat heater so that the heat generating part faces to an inner circumference face of the fixing belt;

a pressuring member being long in the axial direction and sandwiching the fixing belt with the flat heater; and

a connector having a contacting portion coming into contact with the electrode part and being attached to the heater holding part along a face on which the electrode part is formed in a direction orthogonal to the axial direction,

wherein the heat generating part includes a first heat generating part arranged at a center in the axial direction within a range corresponding to a small size sheet and second heat generating parts at both sides from the first heat generating part in the axial direction within a range corresponding to a large size sheet,

the electrode part includes a first electrode part connecting to the first heat generating part by a first feeder, a second electrode part connecting to the second heat generating parts respectively by a second feeder and a third feeder, and a third electrode part connecting to the third heat generating part by a fourth feeder, the first electrode part, the second electrode part, and the third electrode part being arranged in parallel along the axial direction at one end side in the axial direction,

the first feeder is arranged at a far side from the first electrode part in an attaching direction of the connector,

the second feeder is connected to the second heat generating part at one end side in the axial direction and arranged at a far side from the second electrode part in the attaching direction of the connector, and

the fourth feeder is arranged at another end side from the third electrode part in the axial direction,

the third feeder is connected to the second heat generating part at the another end side in the axial direction and has a portion arranged at a near side from the second electrode part in an attaching direction of the connector,

the heater holding part includes a protecting portion covering the portion of the third feeder arranged at the near side from the second electrode part.

2. The fixing device according to claim **1**, wherein

the protecting portion is integrally formed with the heater holding member.

3. An image forming apparatus comprising:

an image forming part forming a toner image on a sheet; and

the fixing device according to claim **2** to fix the toner image on the sheet.

4. The fixing device according to claim **1**, wherein

the protecting portion is a different member from the heater holding member.

5. An image forming apparatus comprising:

an image forming part forming a toner image on a sheet; and

the fixing device according to claim **4** to fix the toner image on the sheet.

6. The fixing device according to claim **1**, wherein

the protecting portion has insulation property and high heat conductivity.

7. An image forming apparatus comprising:

an image forming part forming a toner image on a sheet; and

the fixing device according to claim **6** to fix the toner image on the sheet.

8. The fixing device according to claim **1**, wherein

the connector has a recessed portion penetrating in the axial direction,

the attaching direction of the connector is orthogonal to the axial direction,

the connector is attached to the heater holding part by fitting the heater holding part holding the flat heater into the recessed portion.

9. The fixing device according to claim **8**, wherein

as the contacting portion, two contacting portions are respectively provided on an upper inner face and a lower inner face of the recessed portion so as to protrude to a lower side and an upper side.

10. An image forming apparatus comprising:

an image forming part forming a toner image on a sheet; and

the fixing device according to claim **9** to fix the toner image on the sheet.

11. An image forming apparatus comprising:

an image forming part forming a toner image on a sheet; and

the fixing device according to claim **8** to fix the toner image on the sheet.

12. An image forming apparatus comprising:

an image forming part forming a toner image on a sheet; and

the fixing device according to claim **1** to fix the toner image on the sheet.

13. A fixing device comprising:

a cylindrical rotatable fixing belt;

a flat heater in which an electrode part, a feeder, and a heat generating part are formed in the same face state;

a heater holding part holding the flat heater so that the heat generating part faces to an inner circumference face of the fixing belt;

a pressuring member sandwiching the fixing belt with the flat heater; and

a connector having a contacting portion coming into contact with the electrode part,

wherein the feeder has a portion arranged at a near side from the electrode part in an attaching direction of the connector,

the heater holding part includes a protecting portion covering the portion of the feeder arranged at the near side from the electrode part, and

the protecting portion has insulation property and high heat conductivity.

14. An image forming apparatus comprising:

an image forming part forming a toner image on a sheet; and

the fixing device according to claim **13** to fix the toner image on the sheet.

15. A fixing device comprising:

a cylindrical rotatable fixing belt;

a flat heater in which an electrode part, a feeder, and a heat generating part are formed in the same face state;

a heater holding part holding the flat heater so that the heat generating part faces to an inner circumference face of the fixing belt;

a pressuring member sandwiching the fixing belt with the flat heater; and

a connector having a contacting portion coming into contact with the electrode part,

wherein the feeder has a portion arranged at a near side from the electrode part in an attaching direction of the connector,

the heater holding part includes a protecting portion covering the portion of the feeder arranged at the near side from the electrode part,

the connector has a recessed portion penetrating in an axial direction,

the attaching direction of the connector is orthogonal to the axial direction,

the connector is attached to the heater holding part by fitting the heater holding part holding the flat heater into the recessed portion, and

as the contacting portion, two contacting portions are respectively provided on an upper inner face and a lower inner face of the recessed portion so as to protrude to a lower side and an upper side.

16. An image forming apparatus comprising:

an image forming part forming a toner image on a sheet; and

the fixing device according to claim **15** to fix the toner image on the sheet.

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